

Abstract

In this study, a novel mathematical model is developed and investigated to gain a comprehensive understanding of the dynamics and transmission patterns of the Foot-and-Mouth Disease (FMD) virus. The model has undergone verification to ensure that it possesses a positive and bounded solution. The assessment of stability, both at the disease-free equilibrium point (DFE) and the endemic equilibrium point (EE), is conducted to provide insights into the dynamics of the disease. The reproduction number R_0 of the model at the disease-free equilibrium (DFE) is calculated using the next generation matrix method. The parameters associated with R_0 are likewise scaled using the sensitivity index approach. In addition, the study has also given graphical representations illustrating the relationship between the reproduction number and the states of disease-free and endemic conditions. The proposed approach involves implementing a direct control technique by administering a constant treatment rate to cattle. Ultimately, numerical outcomes are presented in conjunction with visual representations.